

**BAMBECK SYSTEMS INC.**

*Santa Ana, California*

 **VALERO  
ENERGY CORPORATION**

# *The BAMBECK – VALERO Alliance*

## *Heater CO Control Technology*

*Being applied to 82 additional heaters*

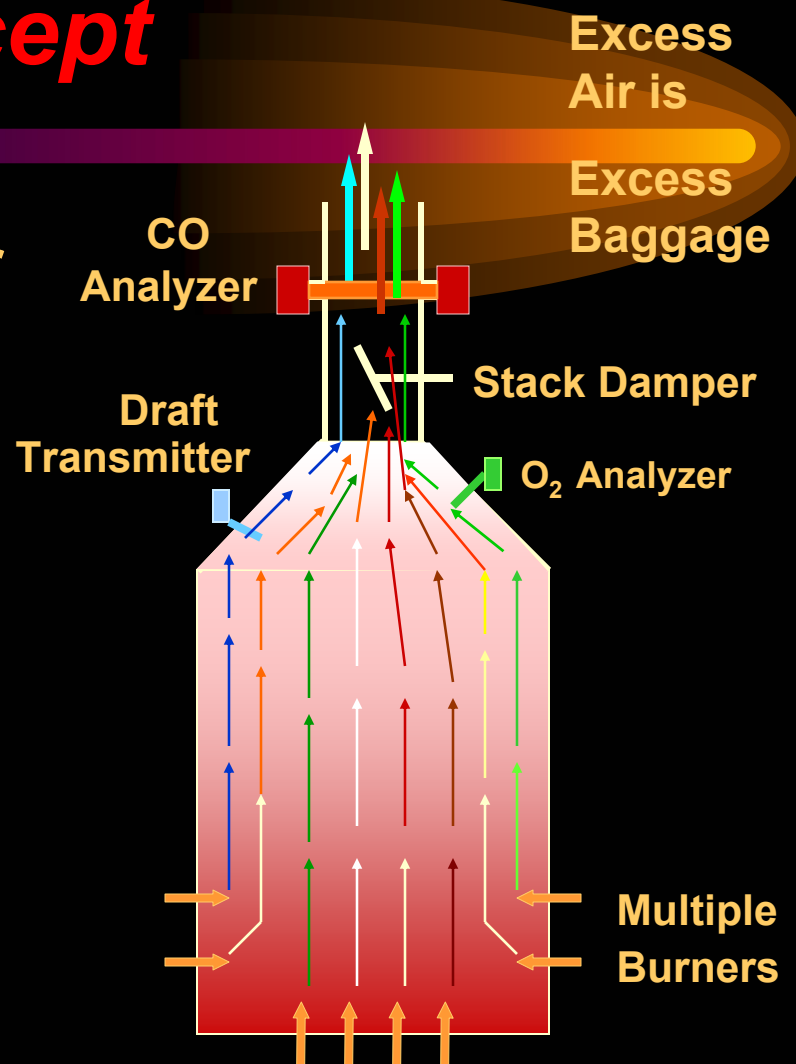
*Currently 13 installed*

*Improves Combustion Efficiency  
Reduces NOx*



# ***BAMBECK Concept***

- A. Minimizes the excess air that is not needed for combustion and eliminates the Btu required to heat that air thus increases the heater efficiency.**
- B. Monitors and Controls unburned fuel gas in a fast & safe way.**





# *Results:*



- 1. O<sub>2</sub> reasonable expectation 0.8%.**
- 2. Safer operation.**  
Correction occurs immediately upon upset conditions; inherently, combustion cannot make high combustibles.
- 3. NO<sub>x</sub> emissions reduced.**  
Actual reduction depends on burner and furnace configuration; typical reductions observed are 10 to 50%.
- 4. Combustion efficiency is improved.**  
Typical improvement ranges between 3% and 5%.
- 5. Greenhouse gas CO<sub>2</sub> emissions reduced.**  
Reduction is directly related to efficiency improvements.

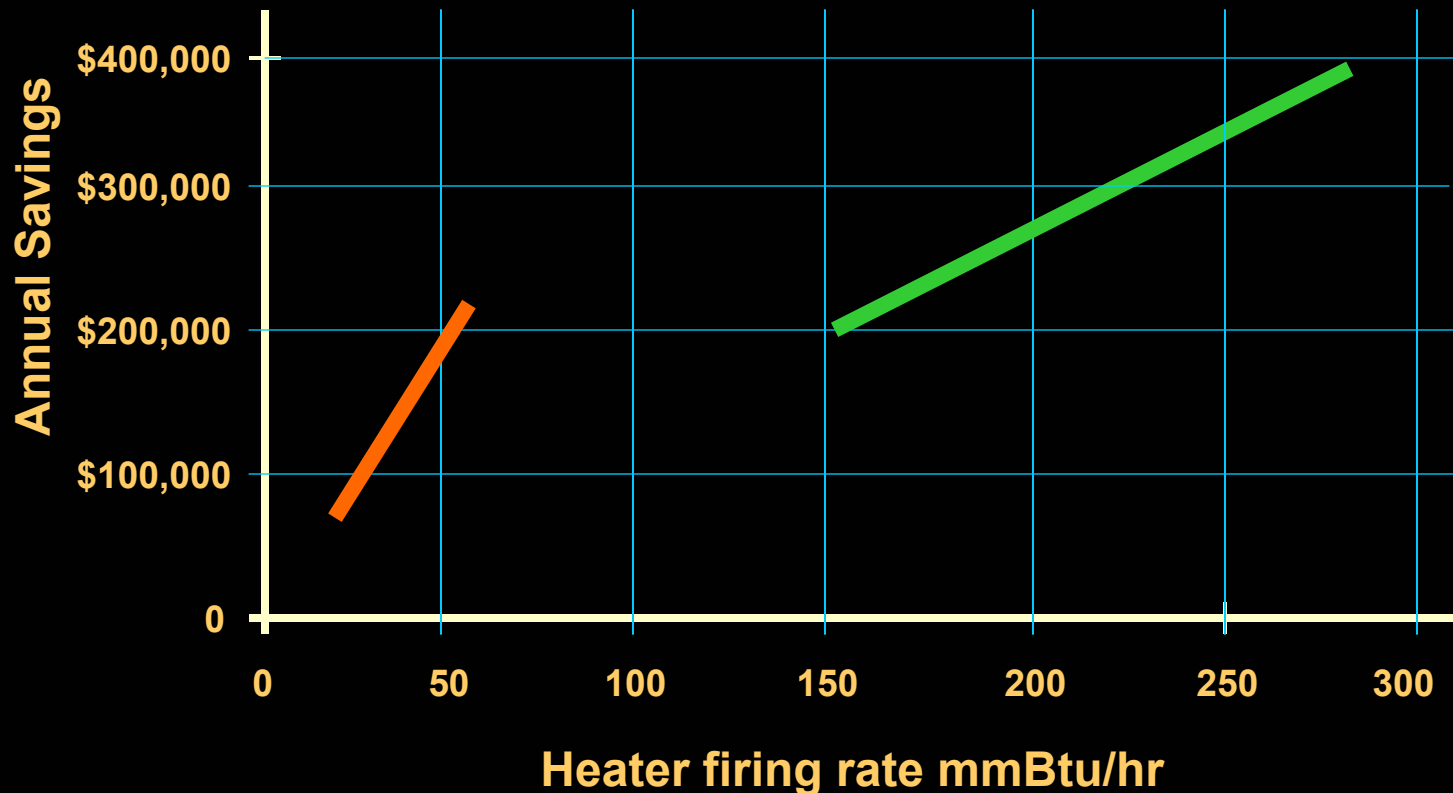


# Fuel Savings at Valero Houston Refinery

**\$4.50 per mmBtu fuel cost**

■ Crude Vacuum 301

■ Crude Atmospheric 201



**Total Savings Over \$500,000 per Yr.**



# ***Bambeck CO Technology - Scope***

## **A. Hardware:**

CO Analyzer  
Draft Transmitter  
Damper Actuator

## **B. Control Strategy:**

Implemented in DCS or in Firmware  
Control Setup & Tuning

## **C. Engineering:**

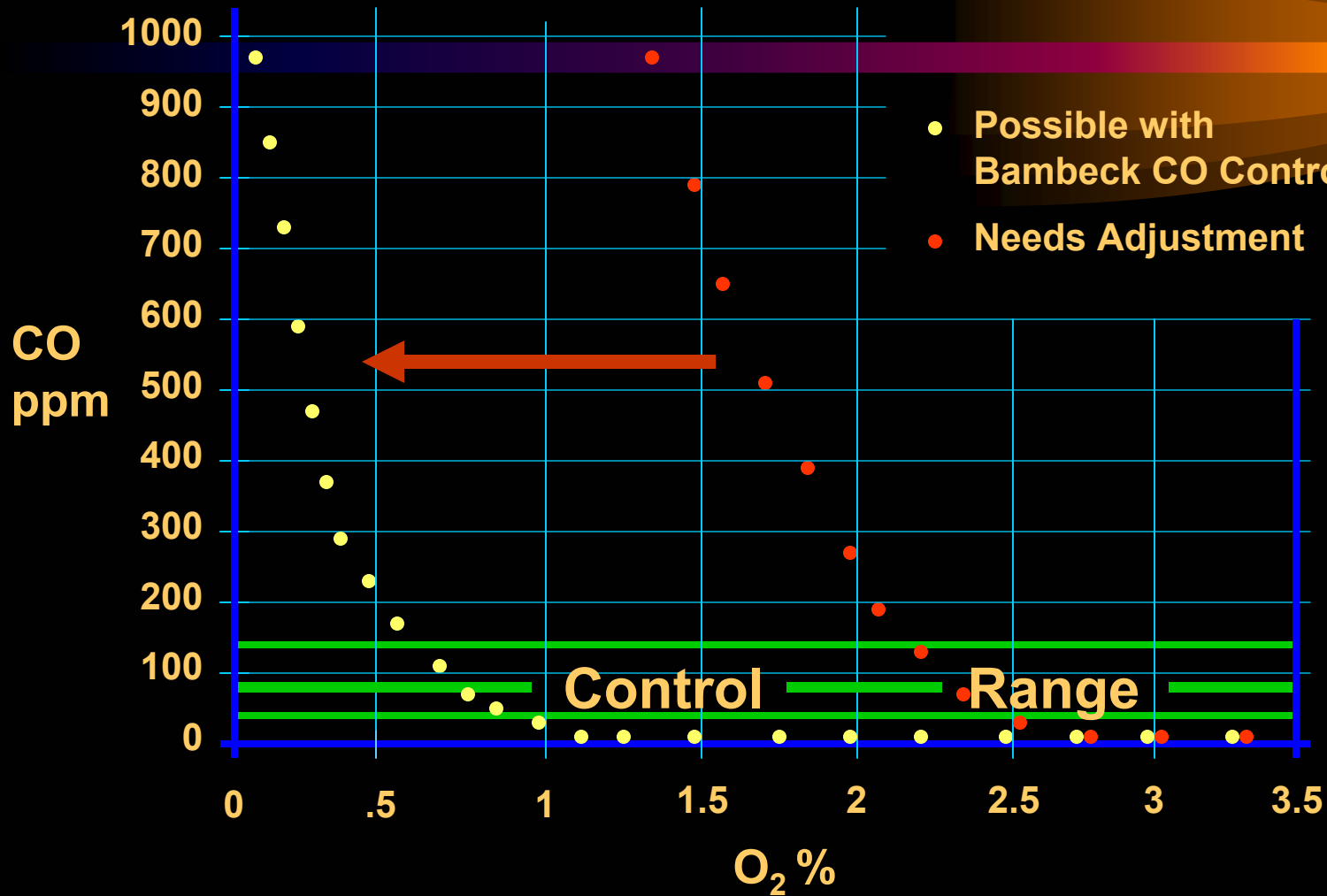
Project Engineering & Drawings  
Field Adjustments & Training

## **D. Installation Turnkey:**

Labor & Materials

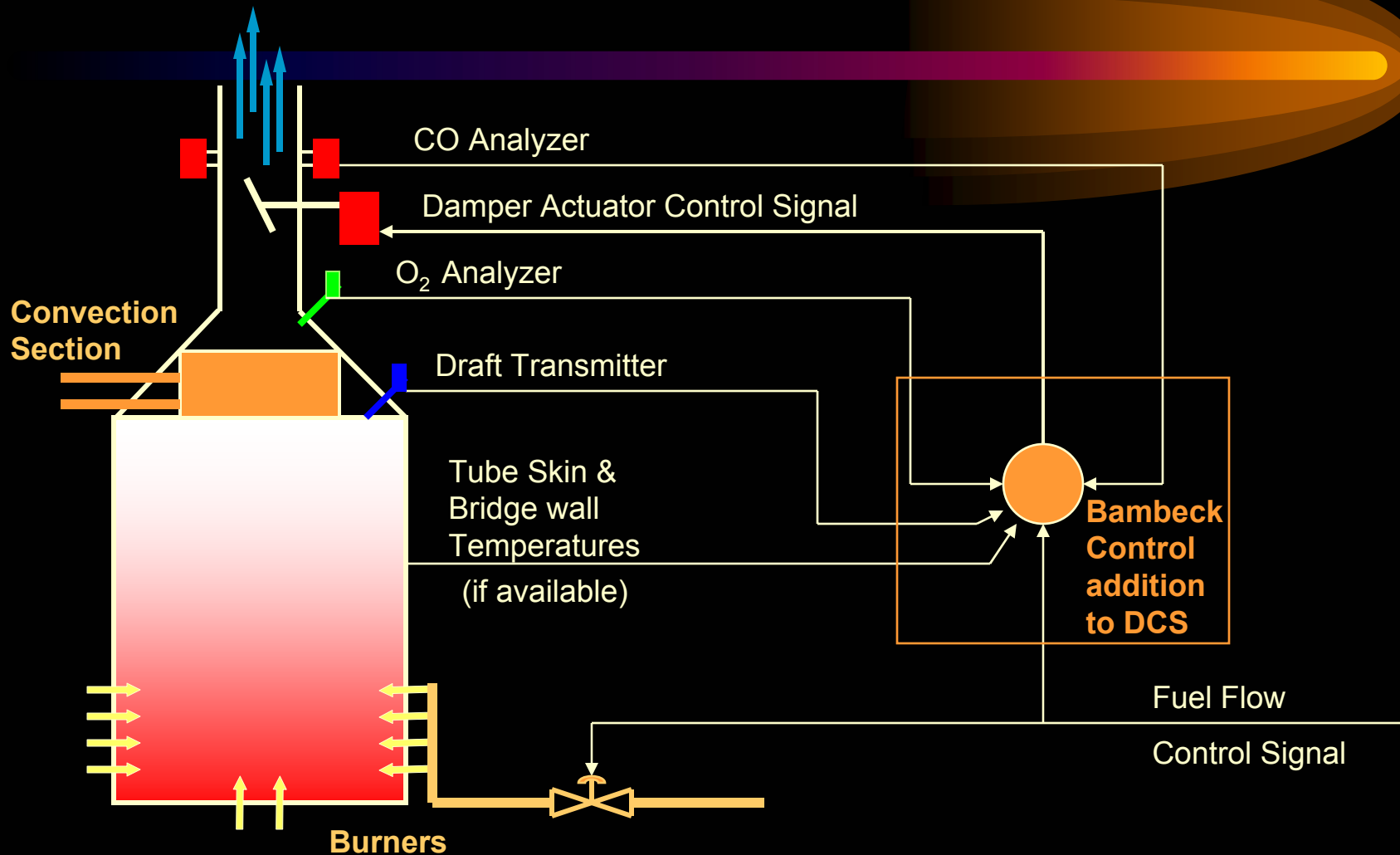


# CO vs. O<sub>2</sub> Relationship





# Control Strategy Natural Draft Heaters

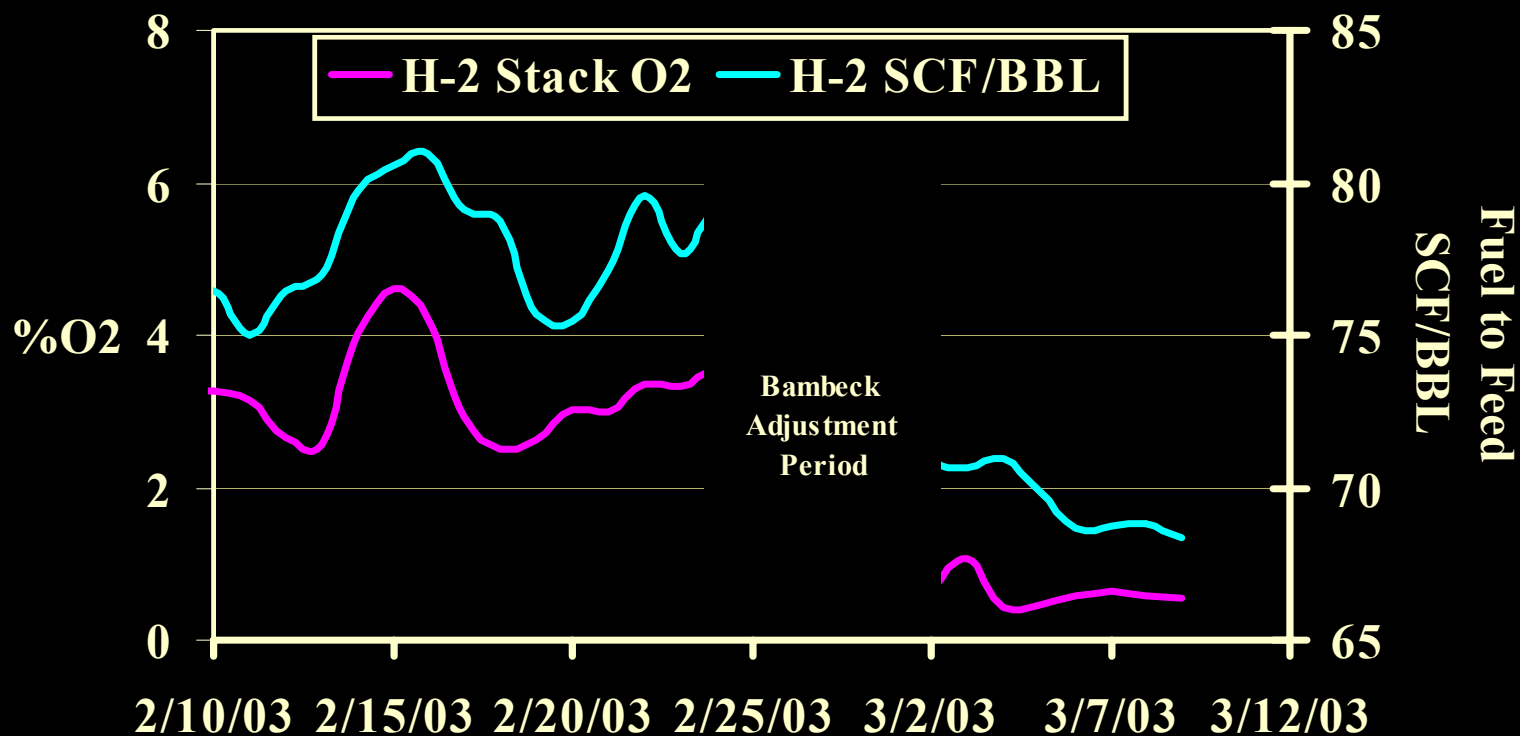




# CO Control Results:

Three Rivers Refinery  
Bambeck CO Control

H-2



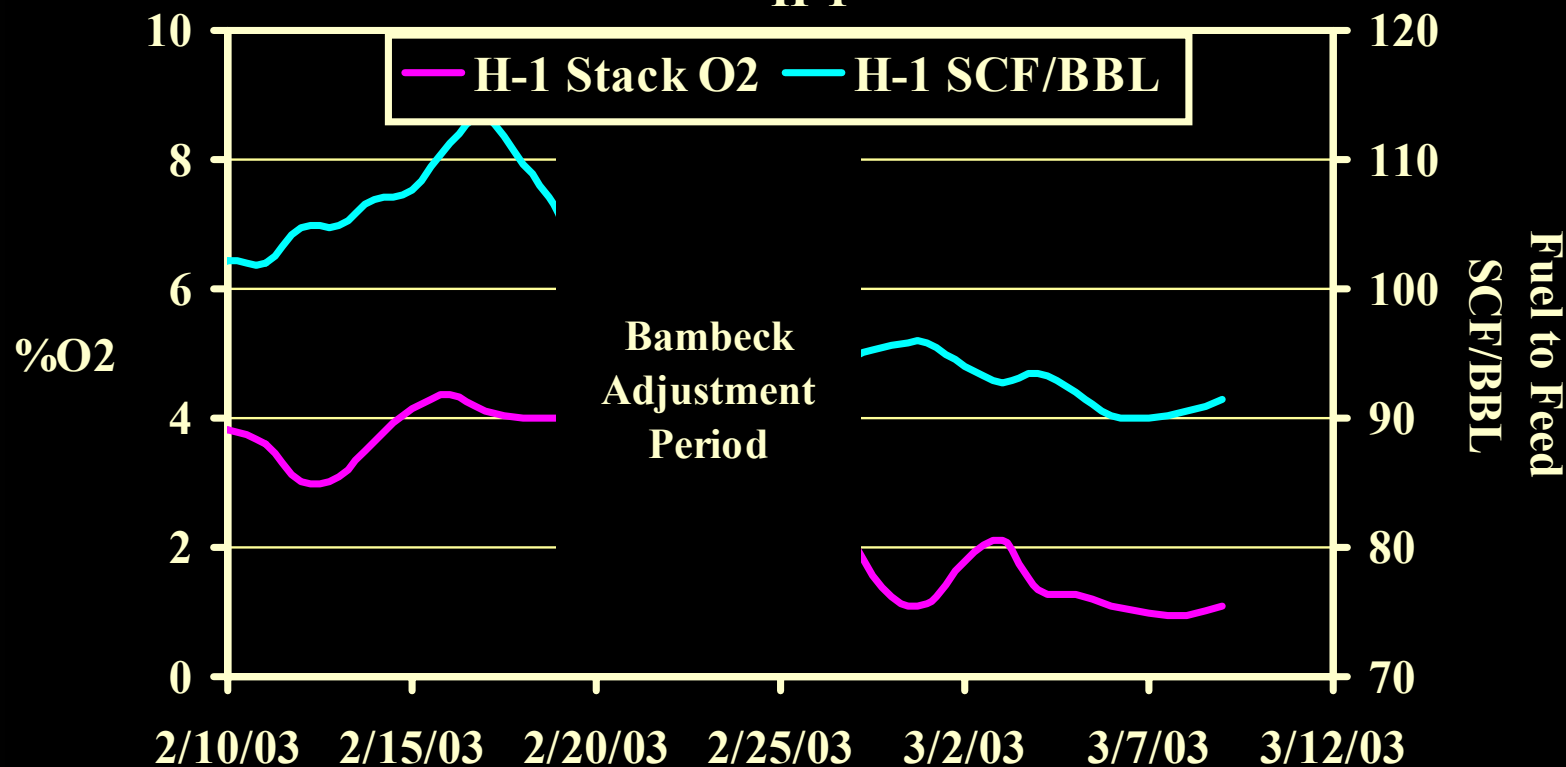


# CO Control Results:

Three Rivers Refinery

Bambeck CO Control

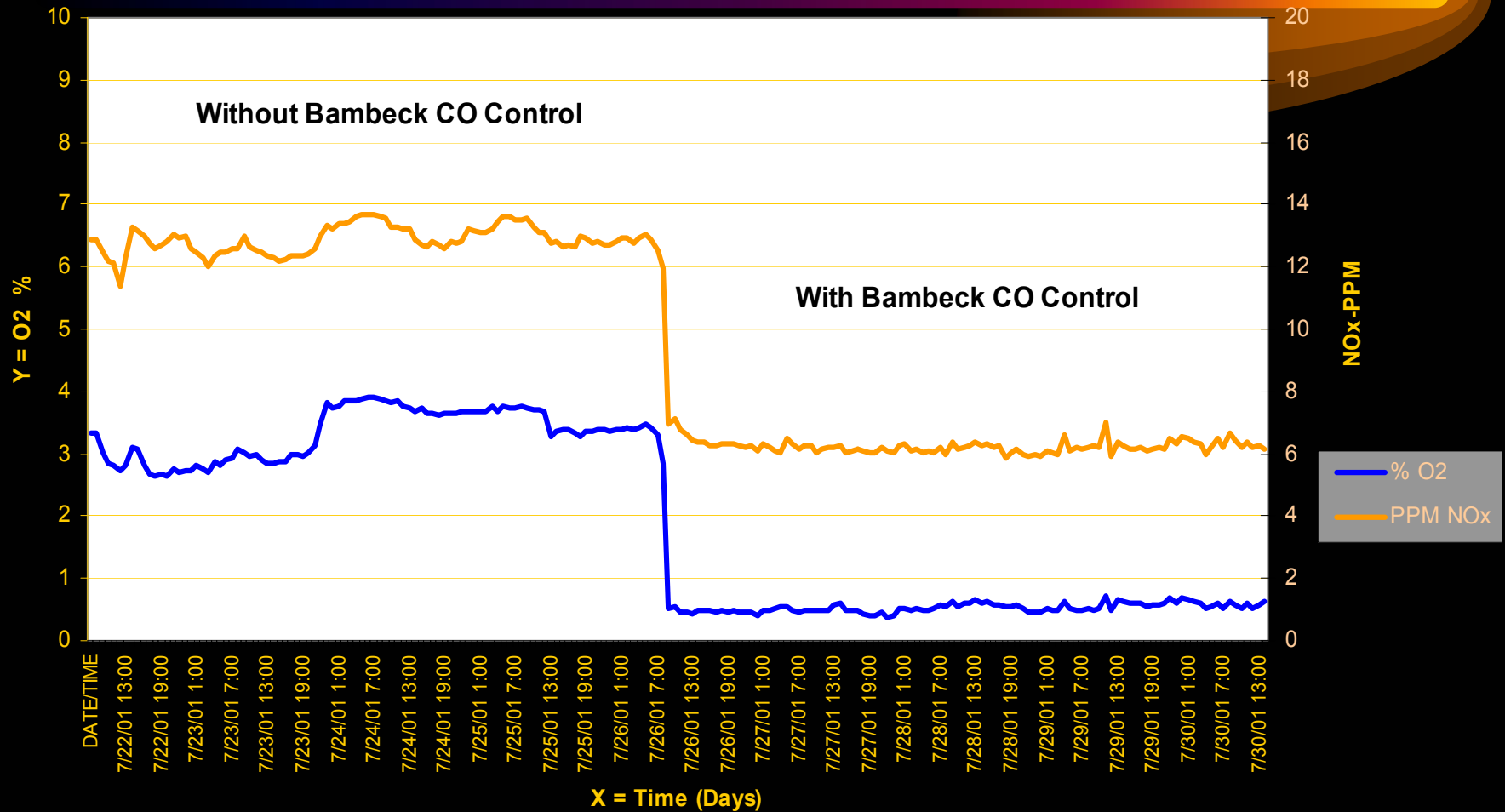
H-1





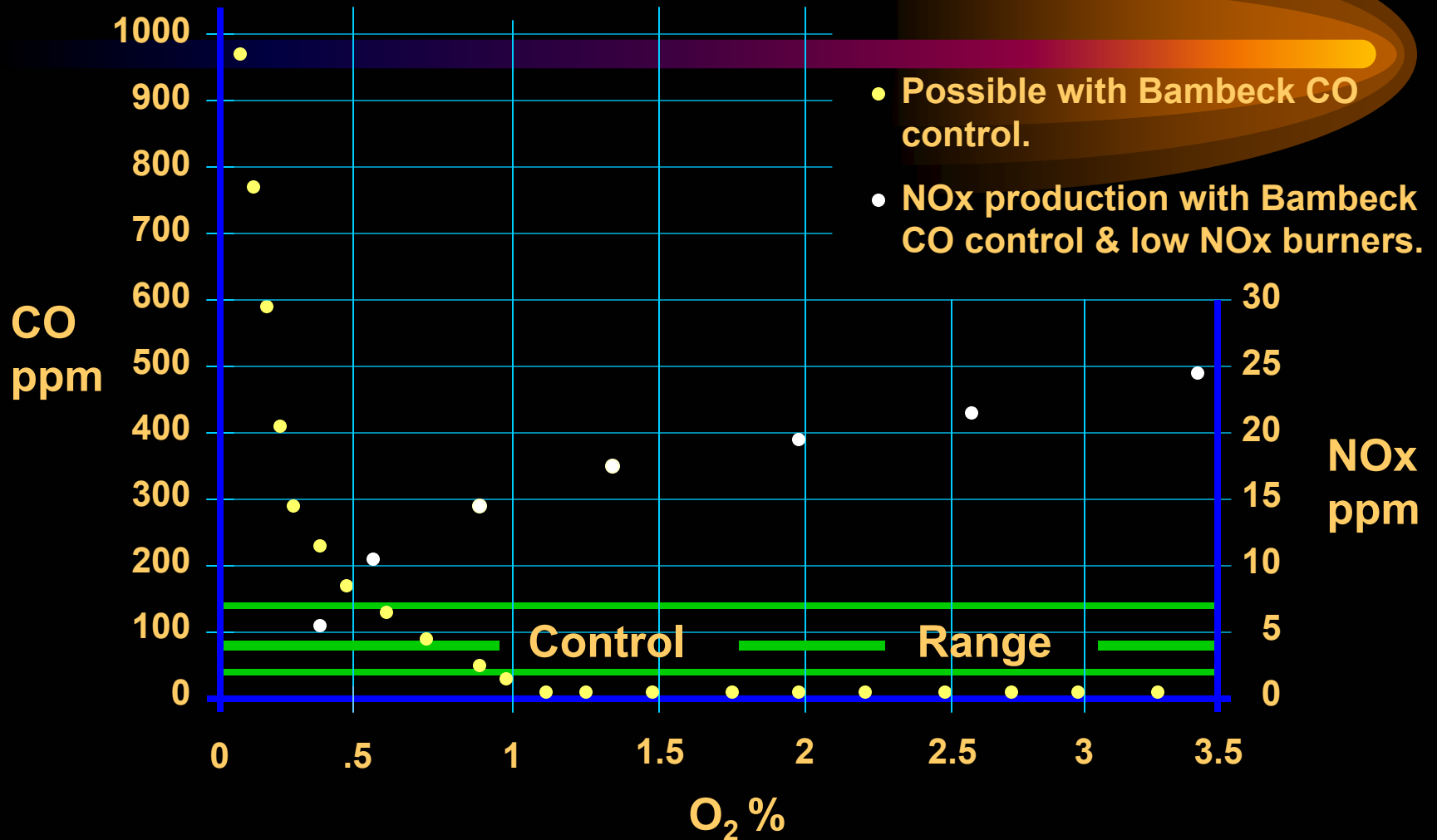
# NOx Results:

## Sample Crude Heater





# CO vs. NOx Relationship





## ***Bambeck CO Control Summary:***

- A. Improves Heater Efficiency.**
- B. Reduces Fuel usage.**
- C. Reduces NO<sub>x</sub> formation.**
- D. Reduces CO<sub>2</sub> emissions.**
- E. Payback from 1/2 to 2 years.**
- F. Safer operation.**





# ***The BAMBECK – VALERO Alliance Continues:***

**DOE awards the Valero-Bambeck team a grant to demonstrate the next step in heater combustion control - automatic burner register control integrated with stack damper CO control.**